PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-133452
(43)Date of publication of application : 21.05.1999

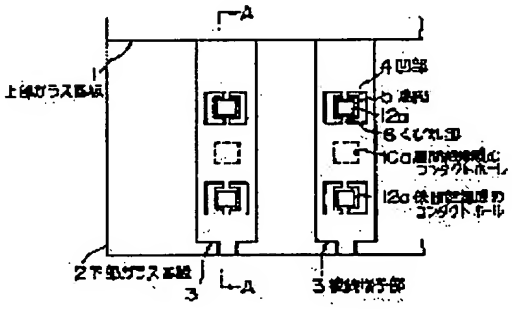
(51)Int.Cl. G02F 1/1345
G02F 1/136
H01L 29/786
H01L 21/336

(21)Application number : 09-295208
(22)Date of filing : 28.10.1997

(71)Applicant : NEC CORP
(72)Inventor : FUJITA AKIRA
SUGITANI CHOEI

(54) SEMICONDUCTOR DEVICE AND ITS PRODUCTION

(57)Abstract:
PROBLEM TO BE SOLVED: To enhance reliability by suppressing the occurrence of the short- circuit by interterminal leakage by the corrosion of metallic wiring even under a high-humidity environment in the connecting terminal parts of an LCD panel in particularly which is an active matrix type display system semiconductor device.
SOLUTION: Interterminal short-circuit preventive patterns are formed on the upper layer metallic wiring in the connecting terminal parts 3 which are drawn out of a lower glass substrate 2 and are used for connection to external driving LSI, etc. These interterminal short-circuit preventive patterns consist of recessed parts and island parts 5. Contact holes 12a of protective insulating films are so formed as to exist on the island parts 5. The protective insulating films have high hygroscopicity and are effective in preventing the infiltration of moisture from outside. In case of the occurrence of corrosion in the island parts 5, the progression of the corrosion is shut off by the recessed parts enclosing the same and is ceased to the corrosion of the island parts 5 alone at the most. Namely, the metal ions eluted from the island parts 5 does not flow outside and the occurrence of the short-circuit by the interterminal leakage is suppressed.



LEGAL STATUS

[Date of request for examination] 28.10.1997
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number] 3102392

[Date of registration] 25.08.2000

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

CLAIMS

[Claim(s)]

[Claim 1] In the semiconductor device which has two or more connection terminal areas which consist of metal wiring pulled out from the substrate in order to connect with an external drive circuit and to impress an electrical potential difference to a pixel electrode The terminals short circuit prevention pattern which becomes metal wiring of said connection terminal area from the pars insularis and the crevice which encloses this is prepared. The front face of said metal wiring which includes the interior of said crevice except for said a part of pars insularis [at least] is covered by the protection insulator layer. The semiconductor device characterized by having come to deposit the transparence electric conduction film on the front face of said protection insulator layer which includes the inside of a contact hole, and the top face of the pars insularis by said pars-insularis top of the part which is not covered by this protection insulator layer serving as a contact hole.

[Claim 2] The semiconductor device according to claim 1 characterized by intercepting advance of the corrosion generated in said pars insularis prepared in metal wiring of said connection terminal area by said crevice, and having constituted and become so that corrosion can be converged only by said pars insularis.

[Claim 3] It is made to connect with metal wiring of said substrate which forms displays other than said connection terminal area. A matrix electrode, The active switching element corresponding to two or more pixel electrodes and these pixel electrode is arranged. Switching of the pixel electrode which corresponds by carrying out the matrix drive of this active switching element has become possible. The semiconductor device according to claim 1 or 2 characterized by being the liquid crystal display panel of active-matrix form means of displaying by which liquid crystal is poured into the electrode field between other substrates which counter said substrate and were stuck.

[Claim 4] The semiconductor device according to claim 3 characterized by said active switching element being a thin film transistor.

[Claim 5] In the semiconductor device which has two or more connection terminal areas which consist of metal wiring pulled out from the substrate in order to connect with an external drive circuit and to impress an electrical potential difference to a pixel electrode The terminals short circuit prevention pattern which becomes metal wiring of said connection terminal area from the pars insularis and the crevice which encloses this is prepared. While making

into a contact hole said pars-insularis top of the part which covers the front face of said metal wiring which includes the interior of said crevice except for said a part of pars insularis [at least] by the protection insulator layer, and is not covered by the protection insulator layer The semiconductor device characterized by preparing the pool section of an owner bottom which arrives at said crevice in said protection insulator layer of the part which adjoins this contact hole, and having come to deposit the transparence electric conduction film on the front face of said protection insulator layer containing each **** of these contact holes and the closed-end pool section.

[Claim 6] The semiconductor device according to claim 5 characterized by intercepting advance of the corrosion generated in said pars insularis prepared in said metal wiring by said crevice and said closed-end pool section, and having constituted and become so that corrosion can be further converged in said closed-end pool section with said pars insularis.

[Claim 7] It is made to connect with metal wiring of said substrate which forms displays other than said connection terminal area. A matrix electrode, The active switching element corresponding to two or more pixel electrodes and these pixel electrode is arranged. Switching of the pixel electrode which corresponds by carrying out the matrix drive of this active switching element has become possible. The semiconductor device according to claim 5 or 6 characterized by being the liquid crystal display panel of active-matrix form means of displaying by which liquid crystal is poured into the electrode field between other substrates which counter said substrate and were stuck.

[Claim 8] The semiconductor device according to claim 7 characterized by said active switching element being a thin film transistor.

[Claim 9] In the semiconductor device which has two or more connection terminal areas which consist of metal wiring pulled out from the substrate in order to connect with an external drive circuit and to carry out electrical-potential-difference impression at a pixel electrode Metal wiring of said connection terminal area consists of lower layer metal wiring and the upper metal wiring between which the interlayer insulation film was made to be placed. The terminals short circuit prevention pattern which consists of pars insularis and a crevice which encloses this is prepared in the homotopic of the both sides of these vertical layer metal wiring. Except for said a part of pars insularis [at least], the front face of said metal wiring including the interior of said crevice is covered by the protection insulator layer. The semiconductor device characterized by having come to deposit

the transparence electric conduction film on the front face of said protection insulator layer which includes the inside of a contact hole, and the top face of the pars insularis by said pars-insularis top of the part which is not covered by this protection insulator layer serving as a contact hole.

[Claim 10] In the manufacture approach of a semiconductor device of having two or more connection terminal areas which consist of metal wiring pulled out from the substrate in order to connect with an external drive circuit and to impress an electrical potential difference to a pixel electrode Said metal wiring is formed by making said substrate deposit a metal membrane in vacuum deposition or a spatter, and performing patterning. The terminals short circuit prevention pattern which becomes a part used as said connection terminal area of this metal wiring from the pars insularis and the crevice which encloses this is formed. While making into a contact hole said pars-insularis top of the part which forms a protection insulator layer except for said a part of pars insularis [at least] on the front face of said metal wiring including the interior of said crevice, and is not covered by this protection insulator layer The manufacture approach of the semiconductor device characterized by what the transparence electric conduction film is deposited on the front face of said protection insulator layer including the inside of this contact hole, and the top face of said pars insularis for.

[Claim 11] In the manufacture approach of a semiconductor device of having two or more connection terminal areas which consist of metal wiring pulled out from the substrate in order to connect with an external drive circuit and to impress an electrical potential difference to a pixel electrode Said metal wiring is formed by making said substrate deposit a metal membrane in vacuum deposition or a spatter, and performing patterning. The terminals short circuit prevention pattern which becomes a part used as said connection terminal area of this metal wiring from the pars insularis and the crevice which encloses this is formed. While making into a contact hole said pars-insularis top of the part which forms a protection insulator layer except for said a part of pars insularis [at least] on the front face of said metal wiring including the interior of said crevice, and is not covered by this protection insulator layer The semiconductor device characterized by what the pool section of an owner bottom which arrives at said crevice is formed in said protection insulator layer of the part which adjoins this contact hole, and the transparence electric conduction film is deposited on the front face of said protection insulator layer containing each **** of these contact holes and the closed-end pool section for.

[Claim 12] In the manufacture approach of a semiconductor device of having two or more connection terminal areas which consist of metal wiring pulled out from the glass substrate in order to connect with an external drive circuit and to impress an electrical potential difference to a pixel electrode The process which carries out sputtering of the interlayer insulation film to said glass substrate, and forms membranes, the process which vapor-deposits or carries out sputtering and forms a metal membrane on it, To the process and coincidence which etch and form a metal membrane in the center section used as the display of a glass substrate so that it may become a matrix-like electrode, to the periphery of a glass substrate The process which forms said connection terminal area which has the terminals short circuit prevention pattern which consists of a neck which is connected with the electrode formed by the center section and connects a crevice, the pars insularis, and these Ryobe, Next, the process which vapor-deposits or carries out sputtering and forms a protection insulator layer, the process which carries out etching removal of said protection insulator layer by which membranes were formed on the pars insularis of said connection terminal area, the protection insulator layer formed by said crevice, and the interlayer insulation film at coincidence, Next, the manufacture approach of the process which vapor-deposits or carries out sputtering and forms the transparence electric conduction film, the process which etches and forms the transparence electric conduction film in the configuration of said connection terminal area, and the semiconductor device which becomes more.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the semiconductor device which improved the drawer wiring terminal structure of the part linked to especially an external drive circuit, and its manufacture approach about a semiconductor device and its manufacture approaches, such as the color LCD (liquid crystal display) which used the active-matrix form display device.

[0002]

[Description of the Prior Art] LCD of active-matrix form means of displaying can realize full color display and high contrast and highly minute-ization.

[0003] This means of displaying forms a matrix electrode and two or more pixel electrodes in the turning-inward side of one of the two's electrode substrate, and the thin film transistor (TFT:Thin Film Transistor) etc. is arranged as an active switching element for every pixel

electrode. The matrix drive of this TFT is carried out, and each pixel electrode is switched through TFT.

[0004] In order to carry out the matrix drive of each switching element by TFT, it is necessary to connect each switching element to LSI of an external drive circuit etc. The connection terminal of the part which pulled out and wired from the liquid crystal panel substrate has covered matrix electrode wiring by the TFT switching element with the transparence electric conduction film which consists of ITO (Indium Tin Oxide) stabilized chemically.

[0005] Drawing 11 and drawing 12 are the top view showing an example of the conventional structure of such a terminal area, and a side-face sectional view from the A-A line of this drawing.

[0006] The transparence electric conduction film 30 is formed between two glass substrates 1 of the vertical section, and 2 by the connection side with the connection component by the side of LSI for a drive, and the metal wiring 11 is formed in the bottom of it. In this case, under the environment of high humidity, since the effectiveness that the transparence electric conduction film formed on the metal intercepts permeation of moisture by porous one is low, it is easy to ionize a metal with that moisture that permeated. Consequently, metallic corrosion occurs, it flows out between terminals, and there is a problem that poor terminals leak occurs.

[0007] In order to cope with this problem, metal wiring of a part which is not protected by the connection member connected to JP,8-6059,A proposed previously by the applicant for this patent in the active-matrix substrate of a publication at an inorganic protective film or this terminal area is removed.

[0008]

[Problem(s) to be Solved by the Invention] However, in the case of the technique of a publication, the following unsolved troubles are in the official report to apply. One is that poor terminals leak occurs, when corrosion arises in the upper metal wiring which is a connection with a plasticity wiring substrate. That is, generally, through the anisotropy electric conduction film, it connects with a tape career packaged air conditioning, and the upper metal wiring of a connection with a plasticity wiring substrate is covered. however, the anisotropy electric conduction film itself -- since a certain amount of hygroscopicity is held, when impurity ion, such as chlorine, has adhered to that the moisture which permeated, and a metal react, or an anisotropy **** film or a plasticity wiring substrate, the adhesion impurity ion and metal will react. Consequently, metallic corrosion occurs and a corrosion metal causes leak between outflow and terminals between terminals.

[0009] Therefore, the purpose of this invention is in the thing which can suppress generating of the short circuit by leak between terminals also in the bottom of the environment of high humidity and for which a semiconductor device and its manufacture approaches, such as a active-matrix form means-of-displaying liquid crystal display panel, are offered especially.

[0010]

[Means for Solving the Problem] In order to connect the semiconductor device of this invention to an external drive circuit and to impress an electrical potential difference to a pixel electrode In the liquid crystal display panel which has two or more connection terminal areas which consist of metal wiring pulled out from the substrate according to active-matrix form means of displaying for example The terminals short circuit prevention pattern which becomes metal wiring of said connection terminal area from the pars insularis and the crevice which encloses this is prepared. The front face of said metal wiring which includes the interior of said crevice except for said a part of pars insularis [at least] is covered by the protection insulator layer. Said pars-insularis top of the part which is not covered by this protection insulator layer serves as a contact hole, and it has come to deposit the transparence electric conduction film on the front face of said protection insulator layer including the inside of a contact hole, and the top face of the pars insularis.

[0011] In this case, advance of the corrosion generated in said pars insularis prepared in metal wiring of said connection terminal area is intercepted by said crevice, and corrosion can be converged only by said pars insularis.

[0012] It is made to connect with metal wiring of said substrate which forms displays other than said connection terminal area in active-matrix form means of displaying. A matrix electrode, The active switching element by TFT (thin film transistor) corresponding to two or more pixel electrodes and these pixel electrode is arranged. Switching of the pixel electrode which corresponds by carrying out the matrix drive of this TFT has become possible, and liquid crystal is poured into the electrode field between other substrates which counter said substrate and were stuck.

[0013] Since metal wiring of the connection terminal area of the part which is not covered with the above configuration by the protection insulator layer effective in intercepting permeation of moisture is made into the pars insularis of a terminals short circuit prevention pattern Since metal wiring by the metal membrane of other parts is covered with the protection insulator layer even if corrosion occurs into the part of this pars insularis, the metal with which advance was intercepted in the

crevice which encloses the pars insularis, and the pars insularis was eluted is also settled in a crevice, and corrosion does not flow out outside, but controls generating of leak between terminals.

[0014]

[Embodiment of the Invention] Hereafter, the liquid crystal display panel which is the gestalt of suitable operation of the semiconductor device by this invention, and its manufacture approach are explained to a detail with reference to a drawing.

[0015] Drawing 1 - drawing 6 show the liquid crystal display panel by the gestalt of the 1st operation. The top view in which drawing 1 shows an assembly perspective view, and drawing 2 shows a connection terminal, and drawing 3 are the sectional views from the A-A line of drawing 2 . Drawing 4 is the sectional view showing the pixel polar zone by TFT of the common knowledge for an understanding explaining the gestalt of this operation.

[0016] Since the configuration of a liquid crystal display panel becomes clear by the manufacture approach of latter-part this invention, it is limited to rough explanation here. As shown in drawing 1 , it has the glass substrates 1 and 2 of the vertical section, and a liquid crystal cell is formed by sticking mutually the glass substrate of these two upper and lower sides with closure resin, and enclosing liquid crystal between substrates. The connection terminal 3 by metal wiring by which pattern formation was carried out as a active-matrix form display electrode is pulled out around a panel, and is connected to connection components, such as LSI for a drive.

[0017] Next, in this liquid crystal display panel, the manufacture approach of the connection terminal 3 pulled out and wired out of the up glass substrate 1 is explained with reference to each drawing besides drawing 1 centering on the production process Fig. of drawing 5 shown in the cross section from the A-A line of drawing 2 .

[0018] As shown in drawing 5 (a), first, on the lower glass substrate 2, by the spatter, Cr (chromium) is deposited on the thickness of 2000A (A), patterning of this is carried out, and the lower layer metal wiring 9 is formed. This lower layer metal wiring 9 forms gate electrode 9a in the TFT section shown in drawing 4 .

[0019] Next, by the plasma-CVD method (chemistry gaseous-phase method: Chemical Vapor Deposition), on the lower layer metal wiring 9, 5000A of sum total thickness is deposited as bipolar membrane by silicon oxide and the silicon nitride, and an interlayer insulation film (passivation) 10 is formed (drawing 5 - b).

[0020] At this time, in the TFT formation section shown in drawing 4 , an amorphous silicon (a-Si) is deposited in the same CVD system, and it is the a-Si film 16 of a non dope 2000A thickness

and n+ The mold a-Si film 17 is grown up into 200A thickness, respectively. Then, pattern formation is carried out so that the a-Si film may remain in this TFT formation section in the shape of an island. The interlayer insulation film 10 of the lower part of the a-Si film left behind in the shape of an island by patterning functions as gate dielectric film.

[0021] On the other hand, the production process of the connection terminal 3 is started, pattern formation is performed to the deposition **** above-mentioned interlayer insulation film 10 in previous drawing 5 (b), and contact hole 10a is formed in the part used as the connection place of the lower layer metal wiring 9 and the upper metal wiring 11 formed at degree process (refer to drawing 5 -c).

[0022] As are shown in drawing 5 (c) of degree process, and formed contact hole 10a is covered, the upper metal wiring 11 by Cr is formed on an interlayer insulation film 10. That is, Cr is deposited on 2000A thickness by the spatter, and the upper metal wiring 11 which performs patterning and is electrically connected to the above-mentioned lower layer metal wiring 9 through contact hole 10a is formed.

[0023] In the TFT formation section of drawing 4 , the upper metal wiring 11 forms drain electrode 11b and source electrode 11c, and forms data signal wiring 11a of a active-matrix form display device by displays other than the TFT formation section.

[0024] Then, in this drawing 5 (c), the terminals short circuit prevention pattern which becomes the upper metal wiring 11 from a crevice 4 and the pars insularis 5 is formed as a summary process which manufactures the connection terminal 3 by this invention. The pars insularis 5 is formed so that it may be located in the lower part of contact hole 12a (refer to drawing 5 -d) formed in the protection insulator layer 12 at degree process, and this encloses this pars insularis 5, it makes a part a crevice 4 and is carrying out pattern formation so that clearly [in the terminal area top view of drawing 2]. The part which connects a crevice 4 and the pars insularis 5 serves as a neck 6.

[0025] Therefore, in the process of following drawing 5 (d), as the upper metal wiring 11 whose terminals short circuit prevention pattern which consists of a crevice 4 and pars insularis 5 has been formed is covered, the silicon nitride of about 2000A of thickness is deposited by the plasma-CVD method, and the protection insulator layer 12 is formed. Patterning is performed to this protection insulator layer 12, and contact hole 12a is formed in the connection place of the upper metal wiring 11 and the transparence electric conduction film 13 (refer to drawing 5 -e) formed at degree

process.

[0026] This contact hole 12a is formed doubling a location on the pars insularis 5 prepared in the upper metal wiring 11, and has a form which encloses that contact hole 12a in a crevice 4.

[0027] At the process of following drawing 5 (e), as contact hole 12a prepared in the protection insulator layer 12 is covered, the transparence electric conduction film 13 which consists of ITO by the spatter on the protection insulator layer 12 is formed by the thickness which is 400A. Drawing 2 is drawing which saw the connection terminal 3 of the process so far with which the transparence electric conduction film 13 was formed from the flat surface, and it will be understood that they are the contact hole which continuous-line 12a in drawing 2 established in the protection insulator layer 12, and the contact hole which broken-line 10a established in the interlayer insulation film 10.

[0028] In that case, in a display, as shown in the TFT formation section of drawing 4 , pattern formation of the transparence electric conduction film 13 is carried out as pixel electrode 13a linked to source electrode 11c.

[0029] The lower glass substrate 2 in which the connection terminal 3 was formed is created by the above process. this -- then, as shown in drawing 3 , in the lower glass substrate 2 and the up glass substrate 1, liquid crystal 14 is poured in between lamination, two vertical glass substrates 1, and 2 with closure resin 15, and the liquid crystal display panel by the gestalt of the 1st operation of the form where two or more connection terminals 3 were pulled out around the up glass substrate 1 is created like illustration.

[0030] That is, in the gestalt of the 1st starting operation, the whole surface of others except the pars insularis 5 of a terminals short circuit prevention pattern is covered with the protection insulator layer 12 as upper metal wiring 11. The upper metal wiring 11 of the part which this covered does not corrode this protection insulator layer 12 in order to hardly let moisture pass.

[0031] By the way, although the pars insularis 5 of the upper metal wiring 11 of the part which is not covered with the protection insulator layer 12 is covered with the transparence electric conduction film 13, it is not so high. [of the moisture-proof function of this transparence electric conduction film 13] Therefore, even if the possibility of corrosion generating is in the pars insularis 5, it converges only by the corrosion of the pars insularis 5, and corrosion is not expanded even to the upper metal wiring 11 of other parts. The amount of the metal ion protruded from the connection terminal 3 also becomes less according to a result and such corrosion prevention effectiveness, and

the probability of short circuit generating by leak between terminals decreases sharply compared with this conventional seed structure.

[0032] The feeder-line resistance goes up by on the other hand having formed the crevice 4 which encloses the pars insularis 5 to the terminals short circuit prevention pattern of the upper metal wiring 11. However, the problem can be solved and conquered through contact hole 10a prepared in the interlayer insulation film 10 by making the lower layer metal wiring 9 flow through the upper metal wiring 11.

[0033] Moreover, the following results were obtained, when LCD was designed using the liquid crystal display panel of the gestalt of the 1st operation and effectiveness was checked.

[0034] Drawing 6 sets up the circumference actual size of the pars insularis 5 of the upper metal wiring 11 prepared in the connection terminal 3. The pitch between terminals of the connection terminal 3 was set to 70 micrometers, and terminal width of face was set to 40 micrometers. The terminals short circuit prevention pattern was formed so that eight pars insularis 5 might be formed in the upper metal wiring 11 of the connection terminal 3 to apply.
 [0035] Thus, after carrying out finger contact of the terminal area of the created connection terminal 3 by hand and polluting a terminal specially, pressure-welding connection of the connection component by the side of LSI for a drive was made with the anisotropy electric conduction film, and it was made to real-operate in 85% of environment at 50 degrees C. After the injection, after 240 hours passed, in the case of the liquid crystal display panel conventionally offered as a sample as elegance, the short-circuit between terminals occurred at the high rate of eight pieces among ten sample offering measurement sizes. In the case of the liquid crystal display panel by the gestalt of the 1st operation of this invention, the good result that there was no generating of fault was able to be obtained to it.

[0036] Next, in drawing 7 and drawing 8, the gestalt of the 2nd operation of this invention by the cross section from the A-A line of drawing 2 is explained. Drawing 7 is drawing corresponding to the terminal area cross-section structure of drawing 3 by the gestalt of the 1st operation, and drawing 8 is the production process Fig. of the terminal area structure. In addition, since the process of the TFT formation section is the same as that of the case of the gestalt of implementation of the above 1st, the duplicate explanation is omitted.

[0037] First, in the process shown in drawing 8 (a), on the lower glass substrate 2, Cr is deposited on 2000A thickness, patterning of this is carried out, and the lower layer metal wiring 9 is

formed by the spatter.

[0038] Next, like drawing 8 (b), by the plasma-CVD method, an interlayer insulation film 10 is deposited on 5000A of sum total thickness as bipolar membrane by silicon oxide and the silicon nitride, and membranes are formed. Then, patterning of this interlayer insulation film 10 is carried out, and contact hole 10a is formed in the connection place of the lower layer metal wiring 9 and the upper metal wiring 11 formed at degree process. In that case, the interlayer insulation film 10 of the periphery of the island-like pattern formed in the upper metal wiring 11 is removed, and the pool section 18 is formed by it.

[0039] Next, in the process shown in drawing 8 (c), Cr is deposited on 2000A thickness by the spatter, patterning of this is carried out, and the upper metal wiring 11 is formed. Besides, the layer metal wiring 11 turns into the lower layer metal wiring 9 connectable electrically by contact hole 10a prepared at the last process.

[0040] The terminals short circuit prevention pattern which consists of a crevice 4 shown in the upper metal wiring 11 with the gestalt of the 1st operation of the above and pars insularis 5 in this phase is formed.

[0041] Next, like drawing 8 (d), by the plasma-CVD method, the silicon nitride of about 2000A of thickness is deposited, the protection insulator layer 12 is formed, patterning of this is carried out and contact hole 12a is formed in the connection place of the upper metal wiring 11 and the transparence electric conduction film 13 formed at degree process.

[0042] Next, like drawing 8 (e), as contact hole 12a is covered, the transparence electric conduction film 13 which consists of ITO by the spatter is formed on the protection insulator layer 12 at 400A thickness.

[0043] The lower glass substrate 2 in which the connection terminal 3 was formed is created by the above process. this -- then, as shown in drawing 7 , in the lower glass substrate 2 and the up glass substrate 1, liquid crystal 14 is poured in between lamination, two vertical glass substrates 1, and 2 with closure resin 15, and the liquid crystal display panel by the gestalt of the 2nd operation of the form where two or more connection terminals 3 were pulled out around the up glass substrate 1 is created like illustration.

[0044] According to the gestalt of this 2nd operation, since the pool section 18 is formed, since the metal corroded as compared with the case where it is the gestalt of the 1st operation of the above is caught by the pool section 18, there is no outflow of a between [terminals], and fault generating of the short circuit by leak between terminals can be suppressed further.

[0045] Next, in drawing 9 and drawing 10 , the gestalt of the 3rd operation of this invention by the cross section from the A-A line of drawing 2 is explained. Drawing 9 is drawing corresponding to the terminal area cross-section structure of drawing 3 by the gestalt of the 1st operation, and drawing 10 is the production process Fig. of the terminal area structure. In addition, since the process of the TFT formation section is the same as that of the case of the gestalt of implementation of the above 1st, the duplicate explanation is omitted.

[0046] First, as shown in drawing 10 (a), on the lower glass substrate 2, by the spatter, Cr is deposited on 2000(s)A thickness, patterning of this is carried out, and the lower layer metal wiring 9 is formed. Under the present circumstances, the lower layer metal wiring 9 forms the terminals short circuit prevention pattern which consists of a crevice 4 and pars insularis 5 like the upper metal wiring 11 (refer to drawing 10 -c) formed at a back process so that the part which is not protected [which is not covered with an insulator layer] may not arise.

[0047] Next, at the process of drawing 10 (b), an interlayer insulation film 10 is deposited and formed in 5000A of sum total thickness as bipolar membrane of silicon oxide and a silicon nitride by the plasma-CVD method. Patterning of this interlayer insulation film 10 is carried out, and contact hole 10a is formed in the part used as the connection place of the lower layer metal wiring 9 and the upper metal wiring 11 of degree process.

[0048] Next, as shown in drawing 10 (c), Cr is deposited on 2000A thickness by the spatter. Patterning of this is carried out and the upper metal wiring 11 connected to the lower layer metal wiring 9 through contact hole 10a is formed. Besides, the terminals short circuit prevention pattern section which consists of a crevice 4 and pars insularis 5 is formed in the layer metal wiring 11.

[0049] Next, as shown in drawing 10 (d), the silicon nitride of 2000A of thickness is deposited by the plasma-CVD method, the protection insulator layer 12 is formed, and contact hole 12a is formed in the part which becomes the connection place of the upper metal wiring 11 and the transparence electric conduction film 13 (refer to drawing 10 -e) formed at degree process. With it, an interlayer insulation film 10 also carries out etching removal with the protection insulator layer 12, and the pool section 18 is formed around the pars insularis 5 formed in the upper metal wiring 11.

[0050] Then, at the process shown in drawing 10 (e), the transparence electric conduction film 13 which consists of ITO by the spatter is formed to 400A thickness, and as the connection terminal 3 is covered, it carries out patterning.

[0051] Thus, the liquid crystal display panel of the gestalt of the 3rd operation

shown in drawing 9 is created by creating the lower glass substrate 2, sticking this lower glass substrate 2 and the up glass substrate 1 with closure resin 15, and pouring in liquid crystal 14 between the glass substrates of the two vertical sections.

[0052] In the liquid crystal display panel of the gestalt of this 3rd operation, even if compared with the case of the gestalt of the 2nd operation of the above, the pool section 18 is deep, consequently the corroded metal can fully be caught in the pool section 18, and a corrosion metal does not flow out outside, but the short circuit prevention effectiveness by leak between terminals doubles further.

[0053] As mentioned above, although the 1st, 2nd, and 3rd three states of the above were explained as a gestalt of suitable operation, in the case of this invention, it is not limited to the gestalt of them 1st - the 3rd operation. As a gestalt of other operations, although Cr was used for the lower layer metal wiring 9 and the upper metal wiring 11 with the gestalt of the above 1st - the 3rd implementation, it may replace with it and you may be the monolayer or compound layer by aluminum, molybdenum, a tungsten, etc. Moreover, the metallic material of the lower layer metal wiring 9 and the upper metal wiring 11 may not necessarily be the same. Furthermore, it can form also about an interlayer insulation film 10 and the protection insulator layer 12 except the ingredient used with the gestalt of each above-mentioned implementation. It is not limited to especially the configuration or the formation number of the crevice 4 of a terminals short circuit prevention pattern, and the pars insularis 5 further again, either.

[0054]

[Effect of the Invention] As explained above, the semiconductor device by this invention, and its manufacture approach Since especially metal wiring of the connection terminal area of the part which is not covered with a protection insulator layer suitable [for the LCD panel of active-matrix form means of displaying] and effective in intercepting permeation of moisture is made into the pars insularis of a terminals short circuit prevention pattern Since metal wiring by the metal membrane of other parts is covered with the protection insulator layer even if corrosion occurs into the part of this pars insularis, the metal of corrosion with which advance was intercepted in the crevice which encloses the pars insularis, and the pars insularis was eluted is also effective in fitting in a crevice, and not flowing out outside, but controlling generating of leak between terminals.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the assembly perspective view showing the liquid crystal display panel which is a semiconductor device by this invention.

[Drawing 2] It is the expansion top view showing the connection terminal area by the gestalt of the 1st operation.

[Drawing 3] It is the side-face sectional view showing the gestalt of the 1st operation by the A-A line cross section of drawing 2 .

[Drawing 4] It is the sectional view showing the TFT formation section of the liquid crystal display panel by active-matrix form means of displaying.

[Drawing 5] (a) - (e) is the side-face sectional view showing the production process of the connection terminal area by the gestalt of the 1st operation in order.

[Drawing 6] It is the expansion top view showing an example which carried out the actual-size design of the terminals short circuit prevention pattern of the important section in the connection terminal area of the gestalt of the 1st operation.

[Drawing 7] It is the side-face sectional view showing the connection terminal area of the gestalt of the 2nd operation by this invention.

[Drawing 8] (a) - (e) is the side-face sectional view showing the production process of the connection terminal area by the gestalt of the 2nd operation in order.

[Drawing 9] It is the side-face sectional view showing the connection terminal area of the gestalt of the 2nd operation by this invention.

[Drawing 10] (a) - (e) is the side-face sectional view showing the production process of the connection terminal area by the gestalt of the 2nd operation in order.

[Drawing 11] It is the expansion top view showing the connection terminal area in the conventional liquid crystal display panel.

[Drawing 12] It is the side-face sectional view of the connection terminal area of the conventional example by the A-A line cross section of drawing 11 .

[Description of Notations]

1 Up Glass Substrate

2 Lower Glass Substrate

3 Connection Terminal Area

4 Crevice (Terminals Short Circuit Prevention Pattern)

5 Pars Insularis (Terminals Short Circuit Prevention Pattern)

6 Neck (Terminals Short Circuit Prevention Pattern)

9 Lower Layer Metal Wiring

9a Gate electrode

10 Interlayer Insulation Film

10a The contact hole of an interlayer insulation film

11 The Upper Metal Wiring

11a Data signal wiring

11b Drain electrode

11c Source electrode

12 Protection Insulator Layer

12a The contact hole of a protection insulator layer

13 Transparence Electric Conduction Film by ITO

14 Liquid Crystal

15 Closure Resin